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Please add the following new claims:

21. (New) A method for reducing profile distortion in wafer fabrication without roughening a semiconductor substrate surface, comprising:

providing a semiconductor substrate comprising a film comprising silicon-nitride;

treating the film in a vacuum of about 3.0-6.5 Torr, for a time of about 10 seconds to about 5 minutes, and in an atmosphere free of argon comprising oxygen plasma as the gas present in the greatest concentration wherein the oxygen plasma flow rate is at least about 300 sccm oxygen and the atmosphere renders the substrate resistant to profile distortion and roughening to make a treated substrate;

applying a resist to the treated substrate; and

patterning the resist.

22. (New) The method of claim 21 and further including exposing oxygen gas to an energy source generating about 150-900 watts in order to make the oxygen plasma.

23. (New) The method of claim 21 wherein the oxygen plasma is made by electromagnetic excitation of oxygen gas by electrodes that are about 400 to 600 mils apart.

24. (New) The method of claim 21 wherein the oxygen plasma is made by an exposure of oxygen gas to an energy source that is RF energy.

25. (New) The method of claim 21 wherein the oxygen plasma is made by an exposure of oxygen gas to an energy source that is microwave energy.

26. (New) The method of claim 21 wherein the reduced profile distortion is footing.

27. (New) The method of claim 21 wherein the reduced profile distortion is undercutting.

28. (New) The method of claim 1 and further including removing the resist from the silicon nitride film with reduced profile distortion.

29. (New) The method of claim 21 wherein the oxygen flow rate is not greater than about 2000 sccm.

30. (New) The method of claim 21 and further comprising adding an inert gas to the oxygen gas.

31. (New) A method for reducing profile distortion in substrate fabrication without roughening a semiconductor substrate surface, comprising:

providing a semiconductor substrate comprising a film comprising silicon-nitride;

treating the film in a vacuum of about 3.0-6.5 Torr, for a time of about 10 seconds to about 5 minutes, and in an atmosphere free of argon comprising oxygen plasma as the gas present in the greatest concentration wherein the oxygen plasma flow rate is at least about 300 sccm oxygen and the atmosphere renders the substrate resistant to profile distortion and roughening to make a treated substrate;

applying a resist to the treated substrate; and

patterning the resist

32. (New) The method of claim 31and further including exposing oxygen gas to an energy source generating about 150-900 watts in order to make the oxygen plasma.

33. (New) The method of claim 31 wherein the oxygen plasma is made by electromagnetic excitation of oxygen gas by electrodes that are about 400 to 600 mils apart.

34. (New) The method of claim 31 wherein the oxygen plasma is made by an exposure of oxygen gas to an energy source that is RF energy.

35. (New) The method of claim 31 wherein the oxygen plasma is made by an exposure of oxygen gas to an energy source that is microwave energy.

36. (New) The method of claim 31 wherein the reduced profile distortion is footing.

37. (New) The method of claim 31 wherein the reduced profile distortion is undercutting.

38. (New) The method of claim 31 and further including removing the resist from the silicon nitride film with reduced profile distortion.

39. (New) The method of claim 31 wherein the oxygen flow rate is not greater than about 2000 sccm.

40. (New) The method of claim 31 and further comprising adding an inert gas to the oxygen gas.

Docket No. 303.531US1 Micron Ref. No. 98-0021
WD # 345953

CLEAN VERSION OF PENDING CLAIMS

OXYGEN PLASMA TREATMENT FOR NITRIDE SURFACE TO REDUCE PHOTO FOOTING
Applicant: Zhiping Yin et al.
Serial No.: 09/259,762

Claims 1-3 and 5-11 and 21-40, as of December 9, 2002 (Date of Response to First Office Action after RCE).

1. (Amended) A method for reducing profile distortion in semiconductor fabrication without roughening a semiconductor substrate surface, comprising:

providing a semiconductor substrate comprising a film comprising silicon-nitride;

treating the film in a vacuum of about 3.0-6.5 Torr, for a time of about 10 seconds to about 5 minutes, and in an atmosphere free of argon comprising oxygen plasma as the gas present in the greatest concentration wherein the oxygen plasma flow rate is at least about 300 sccm oxygen and the atmosphere renders the substrate resistant to profile distortion and roughening to make a treated substrate;

applying a resist to the treated substrate; and

patterning the resist.

2. The method of claim 1 and further including exposing oxygen gas to an energy source generating about 150-900 watts in order to make the oxygen plasma.

3. The method of claim 2 wherein the oxygen plasma is made by electromagnetic excitation of oxygen gas by electrodes that are about 400 to 600 mils apart.

5. The method of claim 2 wherein the oxygen plasma is made by an exposure of oxygen gas to an energy source that is RF energy.

6. The method of claim 2 wherein the oxygen plasma is made by an exposure of oxygen gas to an energy source that is microwave energy.

7. The method of claim 1 wherein the reduced profile distortion is footing.

8. The method of claim 1 wherein the reduced profile distortion is undercutting.

9. The method of claim 1 and further including removing the resist from the silicon nitride film with reduced profile distortion.

10. The method of claim 1 wherein the oxygen flow rate is not greater than about 2000 sccm.

11. The method of claim 1 and further comprising adding an inert gas to the oxygen gas.

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21. (New) A method for reducing profile distortion in wafer fabrication without roughening a semiconductor substrate surface, comprising:

providing a semiconductor substrate comprising a film comprising silicon-nitride;

treating the film in a vacuum of about 3.0-6.5 Torr, for a time of about 10 seconds to about 5 minutes, and in an atmosphere free of argon comprising oxygen plasma as the gas present in the greatest concentration wherein the oxygen plasma flow rate is at least about 300 sccm oxygen and the atmosphere renders the substrate resistant to profile distortion and roughening to make a treated substrate;

applying a resist to the treated substrate; and

patterning the resist.

22. (New) The method of claim 21 and further including exposing oxygen gas to an energy source generating about 150-900 watts in order to make the oxygen plasma.

23. (New) The method of claim 21 wherein the oxygen plasma is made by electromagnetic excitation of oxygen gas by electrodes that are about 400 to 600 mils apart.

24. (New) The method of claim 21 wherein the oxygen plasma is made by an exposure of oxygen gas to an energy source that is RF energy.

25. (New) The method of claim 21 wherein the oxygen plasma is made by an exposure of oxygen gas to an energy source that is microwave energy.

E2 Cont.

26. (New) The method of claim 21 wherein the reduced profile distortion is footing.

27. (New) The method of claim 21 wherein the reduced profile distortion is undercutting.

28. (New) The method of claim 1 and further including removing the resist from the silicon nitride film with reduced profile distortion.

29. (New) The method of claim 21 wherein the oxygen flow rate is not greater than about 2000 sccm.

30. (New) The method of claim 21 and further comprising adding an inert gas to the oxygen gas.

31. (New) A method for reducing profile distortion in substrate fabrication without roughening a semiconductor substrate surface, comprising:

providing a semiconductor substrate comprising a film comprising silicon-nitride;

treating the film in a vacuum of about 3.0-6.5 Torr, for a time of about 10 seconds to about 5 minutes, and in an atmosphere free of argon comprising oxygen plasma as the gas present in the greatest concentration wherein the oxygen plasma flow rate is at least about 300

sccm oxygen and the atmosphere renders the substrate resistant to profile distortion and roughening to make a treated substrate;

applying a resist to the treated substrate; and

patterning the resist

32. (New) The method of claim 31and further including exposing oxygen gas to an energy source generating about 150-900 watts in order to make the oxygen plasma.

33. (New) The method of claim 31 wherein the oxygen plasma is made by electromagnetic excitation of oxygen gas by electrodes that are about 400 to 600 mils apart.

34. (New) The method of claim 31 wherein the oxygen plasma is made by an exposure of oxygen gas to an energy source that is RF energy.

E 2 Cont.

35. (New) The method of claim 31 wherein the oxygen plasma is made by an exposure of oxygen gas to an energy source that is microwave energy.

36. (New) The method of claim 31 wherein the reduced profile distortion is footing.

37. (New) The method of claim 31 wherein the reduced profile distortion is undercutting.

38. (New) The method of claim 31 and further including removing the resist from the silicon nitride film with reduced profile distortion.

39. (New) The method of claim 31 wherein the oxygen flow rate is not greater than about 2000 sccm.

40. (New) The method of claim 31 and further comprising adding an inert gas to the oxygen gas.

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